10.1 Tangents to Circles

Goals • Identify segments and lines related to circles.
• Use properties of a tangent to a circle.

VOCABULARY

Circle

Radius

Congruent circles

Diameter

Chord

Secant

Tangent

Tangent circles

Concentric

Common tangent

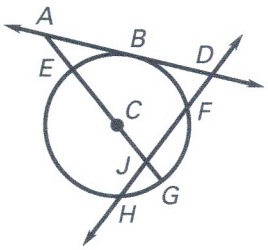
Interior of a circle

Exterior of a circle

Point of tangency

Example 1 ***Identifying Special Segments and Lines***

Tell whether the line or segment is best described as a *chord*, a *secant*, a *tangent*, a *diameter*, or a *radius* of $\odot C$.



a. $\overline{CG}$ **b.** $\overline{EG}$ **c.** $\overleftrightarrow{AD}$

Solution

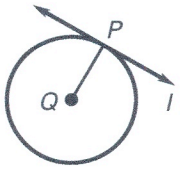
a. $\overline{CG}$ is a _____ because C is the center and G is a point on the circle.

b. $\overline{EG}$ is a _____ because it contains the center C.

c. $\overleftrightarrow{AD}$ is a _____ because it intersects the circle at one point.

THEOREM 10.1

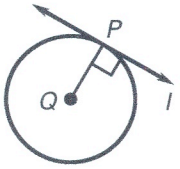
If a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.



If ℓ is tangent to $\odot Q$ at P, then ___ $\perp$ ____.

THEOREM 10.2

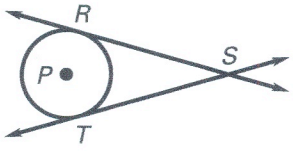
In a plane, if a line is perpendicular to a radius of a circle at its endpoint on the circle, then the line is tangent to the circle.



If $\ell \perp \overline{QP}$ at P, then ___ is tangent to _____.

THEOREM 10.3

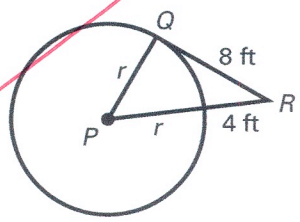
If two segments from the same exterior point are tangent to a circle, then they are congruent.



If $\overleftrightarrow{SR}$ and $\overleftrightarrow{ST}$ are tangent to $\odot P$, then _____ $\cong$ _____.

Example 2 *Finding the Radius of a Circle*

You are standing at R, 4 feet from a fountain. The distance from you to a point of tangency on the fountain is 8 feet. What is the radius of the fountain?



Solution

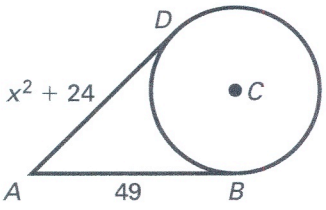
Tangent $\overleftrightarrow{QR}$ is perpendicular to radius $\overline{PQ}$ at Q, so $\triangle PQR$ is a _____. So, you can use the Pythagorean Theorem.

$(r + 4)^2 = r^2 + 8^2$	**Pythagorean Theorem**
$r^2 + 8r + 16 = r^2 + 64$	**Square of binomial**
$8r =$ ___	**Subtract r^2 and 16 from each side.**
$r =$ ___	**Divide.**

Answer The radius of the fountain is ___ feet.

Example 3 *Using Properties of Tangents*

$\overleftrightarrow{AB}$ is tangent to $\odot C$ at B. $\overleftrightarrow{AD}$ is tangent to $\odot C$ at D. Find the value of x.

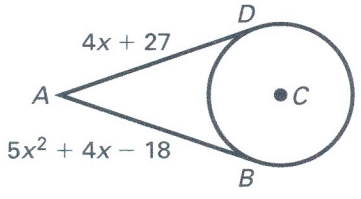


Solution

$AB = AD$	**Use Theorem 10.3.**
___ = _____	**Substitute.**
___ = x^2	**Subtract ___ from each side.**
___ = x	**Find the square roots of ___.**

Checkpoint Complete the following exercise.

1. $\overleftrightarrow{AB}$ is tangent to $\odot C$ at B. $\overleftrightarrow{AD}$ is tangent to $\odot C$ at D. Find the value of x.



LESSON 10.1

NAME _____ DATE _____

Practice A

For use with pages 595–602

The diameter of a circle is given. Find the radius.

1. $d = 6$ in.
2. $d = 24$ cm
3. $d = 15$ ft
4. $d = 9$ in.

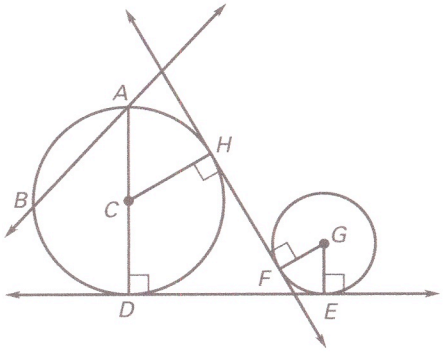
The radius of a circle is given. Find the diameter.

5. $r = 11$ cm
6. $r = 8$ ft
7. $r = 10$ in.
8. $r = 4.6$ cm

Match the notation with the term that best describes it.

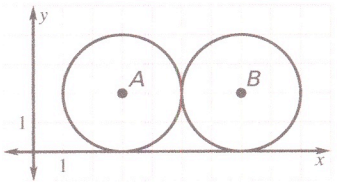
9. D
10. $\overleftrightarrow{FH}$
11. $\overline{CD}$
12. $\overline{AB}$
13. C
14. $\overline{AD}$
15. $\overleftrightarrow{AB}$
16. $\overleftrightarrow{DE}$

A. Center
B. Chord
C. Diameter
D. Radius
E. Point of tangency
F. Common external tangent
G. Common internal tangent
H. Secant



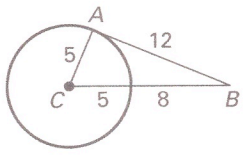
Use the diagram at the right.

17. What are the center and radius of $\odot A$?
18. What are the center and radius of $\odot B$?
19. Describe the intersection of the two circles.
20. Describe all the common tangents of the two circles.
21. Are the two circles congruent? Explain.

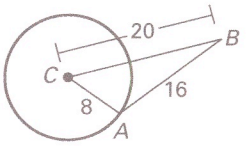


Tell whether $\overleftrightarrow{AB}$ is tangent to $\odot C$. Explain your reasoning.

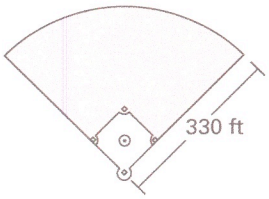
22.



23.



24. ***Baseball Stadium*** The shape of the outfield fence in a baseball stadium is that of a quarter circle. If the distance from home plate to the wall is 330 feet, what is the radius of the entire circle? What is the diameter of the circle?



11-1

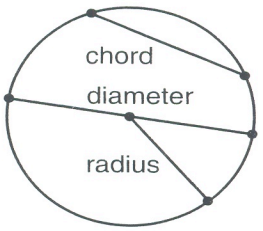
NAME _____ DATE _____ PERIOD 3

Study Guide

10:13 Blue

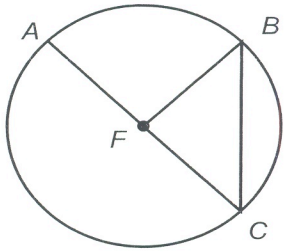
Parts of a Circle

A **circle** is the set of all points in a plane that are a given distance from a given point in the plane called the **center**. Various parts of a circle are labeled in the figure at the right. Note that the diameter is twice the radius.



Example: In $\odot F$, $\overline{AC}$ is a diameter.

- Name the circle. $\odot F$
- Name a radius. $\overline{AF}$, $\overline{CF}$, or $\overline{BF}$
- Name a chord that is not a diameter. $\overline{BC}$



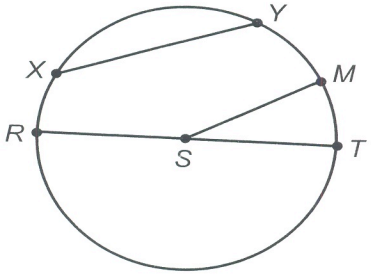
Use $\odot S$ to name each of the following.

1. the center

2. three radii

3. a diameter

4. a chord

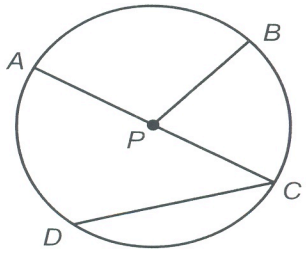


Use $\odot P$ to determine whether each statement is true or false.

5. $\overline{PC}$ is a radius of $\odot P$.

6. $\overline{AC}$ is a chord of $\odot P$.

7. If $PB = 7$, then $AC = 14$.



On a separate sheet of paper, use a compass and a ruler to make a drawing that fits each description.

8. $\odot A$ has a radius of 2 inches. $\overline{QR}$ is a diameter.

9. $\odot G$ has a diameter of 2 inches. Chord $\overline{BC}$ is 1 inch long.

14-2 Study Guide

NAME _____ DATE _____ PERIOD _____

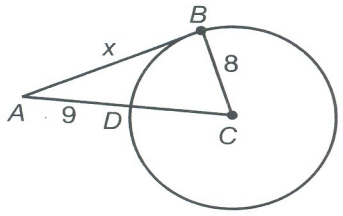
10.1

Tangents to a Circle

A **tangent** is a line in the plane of a circle that intersects the circle in exactly one point. Three important theorems involving tangents are the following.

- In a plane, if a line is a tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.
- In a plane, if a line is perpendicular to a radius of a circle at its endpoint on the circle, then the line is a tangent of the circle.
- If two segments from the same exterior point are tangent to a circle, then they are congruent.

Example: Find the value of x if $\overline{AB}$ is tangent to $\odot C$.

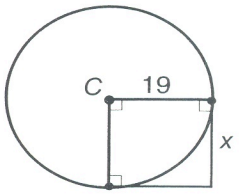


Tangent $\overline{AB}$ is perpendicular to radius $\overline{BC}$.
Also, $AC = AD + BC = 17$.

$$(AB)^2 + (BC)^2 = (AC)^2$$
$$x^2 + 8^2 = 17^2$$
$$x^2 + 64 = 289$$
$$x^2 = 225$$
$$x = 15$$

For each $\odot C$, find the value of x. Assume segments that appear to be tangent are tangent.

1.



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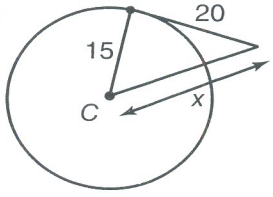

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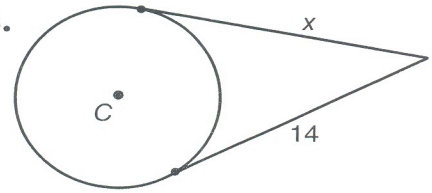

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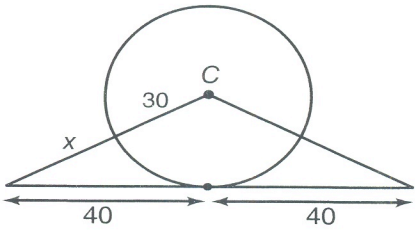
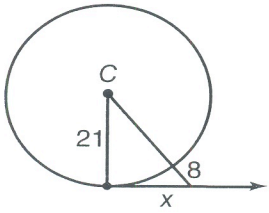
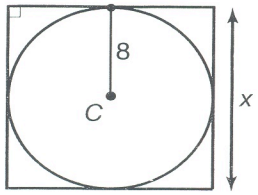


5.



6.



11–1

NAME _____ DATE _____ PERIOD 4

Practice

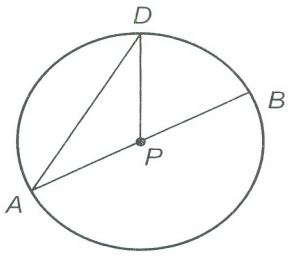
10.1 Blue

Parts of a Circle

Refer to the figure at the right.

1. Name the center of $\odot P$.

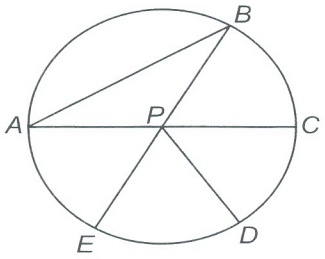
2. Name three radii of the circle.



3. Name a diameter.

4. Name two chords.

***Use circle P to determine whether each statement is* true *or* false.**



5. $\overline{PB}$ is a radius of circle P.

6. $\overline{AB}$ is a radius of circle P.

7. $CA = 2(PE)$

8. $\overline{PB}$ is a chord of circle P.

9. $\overline{AB}$ is a chord of circle P.

10. $\overline{AB}$ is a diameter of circle P.

11. $\overline{AC}$ is a diameter of circle P.

12. $PA = PD$

14-2 Skills Practice

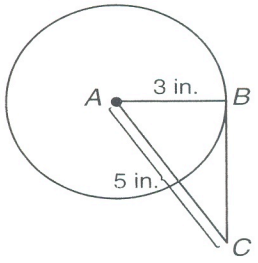
NAME _____ DATE _____ PERIOD ____

10. Blue

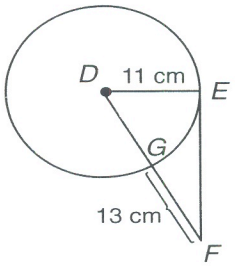
Tangents to a Circle

Find each measure. Round to the nearest tenth if necessary. Assume segments that appear to be tangent are tangent.

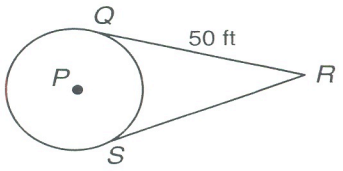
1. BC



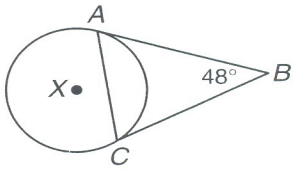
2. DF



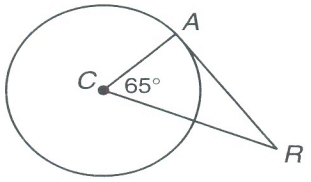
3. SR



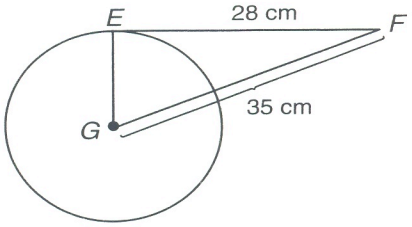
4. $m\angle BAC$



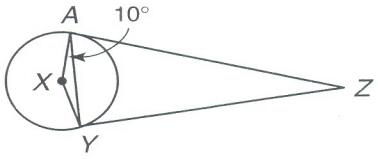
5. $m\angle ARC$



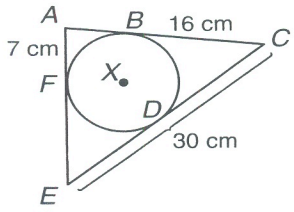
6. EG



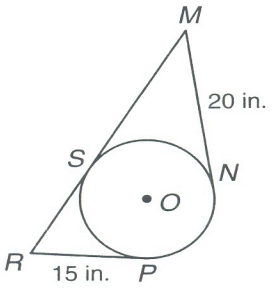
7. $m\angle ZAY$



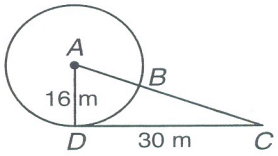
8. FE



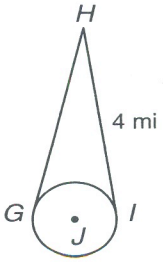
9. MR



10. BC



11. HG



12. $m\angle XZY$